

## **Andrea J. Ray, Ph.D.**

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### **NOAA Earth Systems Research Laboratory**

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### ***Education***

- Ph.D. Univ. of Colorado, Department of Geography, 2004  
Environmental Policy Certificate, Univ. of Colorado Policy Sciences Committee, 1999  
M.S. University of Delaware, Oceanography, 1989  
A.B. University of Chicago, Geophysical Sciences, 1985

### ***Appointments***

- Physical Scientist (1999-present) NOAA-OAR Earth Systems Research Lab, Physical Sciences Division (formerly the Climate Diagnostics Center), Boulder, CO  
Marine Science Policy Analyst (1997-1999), NOAA-OAR Environmental Research Labs, Boulder, CO  
Marine Science Policy Analyst (1995-1997), NOAA-OAR Program Development & Coordination, Silver Spring, MD  
Climate & Research Programs Specialist (1994-1995), NOAA Office of Policy & Strategic Planning, Washington, DC  
Marine Science Policy Analyst (1991-1994), NOAA-OAR Program Development & Coordination Office, Silver Spring, MD  
John D. Knauss Marine Policy Fellow (1990), Office of the Oceanographer of the Navy, Washington, DC

### ***Selected Publications:***

- Lowery, J.L., A.J. Ray, R.S. Webb. 2009. Factors Influencing the Use of Climate Information by Colorado Municipal Water Managers. Submitted to Journal of Climate Research.
- Ray, A.J., J.J. Barsugli, K.B. Averyt, K. Wolter, M. Hoerling, 2008. Colorado Climate Change: A Synthesis To Support Water Resource Management and Adaptation, a report for the Colorado Water Conservation Board by the NOAA-CU Western Water Assessment, available at: [www.cwcb.state.co.us](http://www.cwcb.state.co.us)
- Kenney, D., A.J. Ray, B. Harding, R.S. Pulwarty, B. Udall, 2008. Rethinking Vulnerability on the Colorado River. Submitted to *Water Resources Impact*.
- Ray, A.J., 2008. Water Resources Decision-Makers and their needs for Decadal Climate Prediction, US CLIVAR Variations Newsletter, Oct 2008.
- Ray, A.J., G.M. Garfin, R. Varady, et al. 2007. Monsoon Region Climate Applications: Integrating Climate Science with Regional Planning and Policy, *BAMS*, 88:933–935. This is a summary of the 2006 Monsoon applications workshop. Ray, A.J., et al. 2007.
- Ray, A.J., J.J. Barsugli, and T. Hamill. 2007. Integrating assessments of user needs with weather research: Developing user-centric tools for reservoir management. American Meteorological Society 16th Conference on Applied Climatology: Extended Abstracts. Boston: AMS.
- Ray, A. J., G. M. Garfin, M. Wilder, M. Vásquez-León, M. Lenart, and A. C. Comrie, 2006: Applications of monsoon research: Opportunities to inform decisionmaking and reduce regional vulnerability. *Journal of Climate*, 20:1608–1627.
- Ray, A. J., 2004: Linking climate to multi-purpose reservoir management: Adaptive capacity and needs for climate information in the Gunnison Basin, Colorado. Dissertation, Dept of Geography, Univ. of Colorado, 328pp.
- Ray, A.J. 2003. Reservoir management in the Interior West: the influence of climate variability and functional linkages of water. Pp 193-217 in *Climate, water, and transboundary challenges in the Americas*, Henry Diaz and Barbara Morehouse, eds. Kluwer Press.

Ray, A. J., N. Schmidt, B. J. Morehouse, and R. S. Webb, 2003: Report on Research Opportunities for Climate and Society Interactions in the North American Monsoon Region. Workshop on Applications and Human Dimensions of Monsoon Research 18-20 June 2001, Tucson, AZ, Institute for the Study of Planet Earth, University of Arizona, 42 pp.

### ***Selected presentations***

- Ray, A.J., 2008. Climate Change in Colorado: Creating a Synthesis to Support Water Resources Management and Adaptation. Climate Prediction Assessment workshop (CPASW), Norman, OK, March 2009
- Ray, A.J., 2008. Lessons learned from the 2000s Western drought: Evolving linkages between research and services (invited), Joint Climate Diagnostics and Prediction Workshop/CLIVAR drought meeting October 2008, Lincoln, NE.
- Ray, A.J. Overview of IPCC findings and impacts and vulnerability in the Intermountain West. Invited presentation to the Utah Water Users Association Meeting. This association represents Utah water entities including irrigators, municipal users, industry, and government. Attended by over 150 people, and focused on providing a background on climate change. Salt Lake City, UT, Dec. 3-5, 2007
- Ray, A.J. 2007. Summary of the IPCC 4th Assessment Report: Physical Basis of Climate Change and Adaptation, Impacts and Vulnerability, Colorado River Water Conservancy District, State of the River Meeting. Presented at two public events to over 300 people with water user entities including irrigators, municipal users, industry, federal, state, county and local agencies and private entities.
- Ray, A.J. September 21, 2007. Integrating climate science with regional planning and policy. Invited presentation at the Global Earth Observing System of Systems (GEOSS) Workshop: Regional Decisions for Climate Change, addressing how GEOSS will support citizens and public officials in making decisions based on predictions of regional climate change.
- Ray, A.J.(2008). Integrated and Adaptive Reservoir Management in the Context of Hydroclimatic Variability: a Case Study of the Gunnison Basin, Colorado, Eos Trans. AGU, 88(52), Fall Meet. Suppl., Abstract H24A-02.
- Ray, A.J. and D. Kenney. 2007. Critical challenges in incorporating climate into management of the Colorado River. Presentation at the AMS Second Symposium on Policy and Socio-economic Research, 2007 AMS Annual Meeting, San Antonio, TX, January 2007.
- Ray, A.J., 2007. Lessons learned from the 2000s Western drought: Evolving linkages between research and services (invited). Climate Prediction Assessment Workshop, March 2006, Seattle, WA
- Ray, A.J. 2006. Climate products and forecasts: Resources for understanding climate and how they can be utilized. Workshop on "Water, Drought, and Wyoming's climate," at the UW Ruckelshaus' Institute. Over 100 attendees.
- Ray, A.J., and J.L. Lowrey, 2006. Uses and needs for climate information by municipal water providers on the Front Range of Colorado. Presentation at the NOAA Climate Prediction Assessment Workshop, March 21-24, 2006, Tucson, AZ.
- Ray, A.J., and R.S. Pulwarty, 2005. Water resources and drought: Critical information needs. Invited presentation at the workshop on "Observational and Modeling Requirements for Predicting Drought on Seasonal to Decadal Time Scales, Invited. College Park, MD, 17-19 May 2005.
- Ray, A.J., R.S. Pulwarty and R.S. Webb, User studies: contributing to developing regional decision support and climate services," at the NOAA Climate Prediction Assessment Workshop, Tallahassee, FL, March 2004
- Ray, A.J., R.S. Webb, and R.S. Pulwarty 2003. A user study approach for identifying needs for regional climate services. 2003 AMS Annual Meeting, Long Beach, CA.

### ***Synergistic Activities***

1) As part of the NOAA/CIRES Western Water Assessment, a sponsored by NOAA/OGP, worked on the interaction climate and multi-purpose reservoir management in several western reservoir systems,

municipal water management and climate, and edit a regularly issued "Intermountain West Climate Summary." Organized a number of WWA-sponsored workshops for water and other natural resource managers to learn about climate and weather products and research.

2) Additional projects: Transitioning medium-range weather forecasts to applications in water management and by the NWS; applications of new short-term to seasonal hydrologic forecasts in northwest Mexico by water managers; and a study of climate and the Colorado River Compact.

3) Co-Convened a Union session for the Spring 2007 AGU Joint Assembly with the Mexican Geophysical Union, "Human Dimensions of Climate Variations in the Americas," with Paty Romero Lankao (NCAR/ISSE) and Cecilia Conde (UNAM)

4) Member of the Science Working Group for the North American Monsoon Experiment (NAME).

5) Co-Organizer, Monsoon Region Applications Research Workshop, Guaymas, MX in May 2006, and the Workshop on Monsoon Applications and Human Dimensions, Tucson, AZ, June 2001; and co-organizer of the "Regional Climate Forum for Northwest Mexico and the Southwest U. S.," Ensenada, MX, April, 2008.

6) Co-Program Manager for NOAA Pan American Climate Studies (PACS) from 1995-2000, \$5.3M research program to improve predictions for seasonal climate over the Americas.

### ***Proposals funded:***

Udall, B. and Ray, A.J. Funding for Colorado Climate Change: A Synthesis To Support Water Resource Management and Adaptation, a report for the Colorado Water Conservation Board to the NOAA-CU Western Water Assessment, 2008.

Lettenmaier, D.L., A.J. Ray, and R. Lobato, Intraseasonal-to-interannual hydrologic prediction and water resource applications in the NAME Tier 1 Core Area, from the NOAA Climate Prediction Program for the Americas, 2006-2009

Kenney, D. and A.J. Ray, Climate and Management of the Colorado River Human Dimensions, from NOAA Human Dimensions program, 2005-2007

Ray, A.J., and J. Barsugli. Improved medium-range weather forecasts for water management, from the US Bureau of Reclamation, Lower Colorado Office, 2006-2008.

Ray, A.J. NOAA Upper Colorado River Basin Streamflow Forecast Improvement Project, from the State of Colorado Water Conservation Board, 2003-4.

### ***Professional Development***

NOAA Leadership Seminar, Airlie, VA, Summer 2008

WAS\*IS, Weather and Society Integrated Studies workshop participant, Summer 2006

NOAA EEO and Diversity Training

Inter-Americas Institute for Global Change Research Summer Institute in Interdisciplinary Global Change Science, 11-30 July, 1999, Miami, FL

RiverWare, Introduction to Simulation Modeling (Jul '00) and Introduction to Rules-based Simulations (Dec '00), University of Colorado Center for Advanced Decision Support for Water and Environmental Systems

### ***Service and community activities***

Mentor for NOAA Hollings Undergraduate Scholars, Summers 2007, 2008, 2009

Center for Resource Conservation (Boulder-based non-profit), Board of Directors, 2007-present

Served on the Committee to pass a ballot initiative to fund the City of Boulder's Climate Action Plan, "Yes on 202," Fall 2006.

Instructor, Water Resource Management and Development in the U.S. West, an upper division undergraduate course, Summer 2001, Dept of Geography, University of Colorado.

Guest lecturer in Geography courses on Climate and Vegetation; Water Resource Management and Development; Environmental History, and others